



## **An Assessment of Low-Pressure Crude Oil Pipelines and Gathering Lines**

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### Chapter 1 **Introduction**

The McGrath Lake oil spill in Ventura County stimulated public concern regarding crude oil gathering pipeline safety. The December 22, 1993 incident occurred from a crude oil shipping line. This spill released an estimated 2,200 barrels (42 gallons = 1 barrel) of crude oil. The oil surfaced and flowed through a culvert, traveled through 150 feet of woodland and brush, to McGrath Creek, then flowed another 1,200 feet into McGrath Lake. The lake is part of a tidal wetland within a large coastal dune system.

One of the results of this incident was the passage of California Assembly Bill 3261 (O'Connell) as codified in Section 51015.05 of the California Government Code. This statute requires that the California State Fire Marshal (CSFM):

- ! establish and maintain a centralized database containing specific information and data (pipeline locations, ownership, age, inspection history, etc.) regarding certain crude oil pipelines,
- ! conduct a study of the fitness and safety of these crude oil pipelines, and
- ! investigate incentive options that would encourage pipeline replacement or improvements, including, but not limited to, a review of existing regulatory, permit, and environmental impact report requirements and other existing public policies that could act as barriers to the replacement or improvement of these pipelines.

The following pipelines have been included in the data base and study:

- ! pipelines for the transportation of crude oil that operate at gravity or at a stress level of 20% or less of the specified minimum yield strength of the pipe; and,
- ! pipelines for the transportation of petroleum (crude oil) in onshore gathering lines located in rural areas.



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Pipelines meeting this criteria have been included in the study and database whether they were operating or not during the study period; even abandoned, idle, or otherwise out of service pipelines have been included in the study and database. The following pipelines were *excluded* from the data base and study:

- ! interstate and intrastate pipelines which are currently regulated by the California State Fire Marshal or the United States Department of Transportation;
- ! gathering lines located entirely within the boundary of a California Division of Oil, Gas, and Geothermal Resources (DOGGR) oil field boundary, or which cross a boundary where two DOGGR oil fields are contiguous and are contained entirely within multiple DOGGR oil fields;
- ! flow lines located entirely within the boundary of a DOGGR designated oil field boundary, or which cross a boundary where two DOGGR oil fields are contiguous and are contained entirely within multiple DOGGR oil fields;
- ! natural gas pipelines;
- ! refined petroleum product pipelines; and
- ! abandoned pipelines which have been physically removed.

This report, combined with the completed database, are intended to meet the law's requirements of the CSFM. This report analyzes California's crude oil gathering pipeline risks utilizing leak incident data from January 1993 through December 1995. The database includes a complete inventory of the pipelines meeting the study criteria, their ownership and location, inspection and maintenance practices, the incidents which occurred from these lines during the study period, and various other data.

The study was funded by the U. S. Department of Energy, Bartlesville Project Office (USDOE), through its Management and Operations contract with BDM/Oklahoma, Inc. Jerry Simmons served as BDM/Oklahoma's project manager. EDM Services, Inc. conducted this study as a subcontractor to BDM/Oklahoma. Brian L. Payne served as the overall project manager and authored this report, except for Chapter 5. Chapter 5 and the conclusions/recommendations sections in the report concerning Incentives/Barriers was authored by Deborah Pratt and Jerry R. Simmons of BDM/Oklahoma.



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### **1.1 Regulatory Authority**

The California State Fire Marshal (CSFM) exercises safety regulatory jurisdiction over interstate and intrastate pipelines used for the transportation of hazardous or highly volatile liquid substances within California. In 1983, the Pipeline Safety and Enforcement Program was specifically created to administer this effort.

In 1987, CSFM acquired the regulatory responsibility for interstate lines when an agreement was executed with the United States Department of Transportation (USDOT). In doing so, CSFM became an agent of the USDOT responsible for ensuring that California interstate pipeline operators meet federal pipeline safety standards. Specifically, interstate pipelines under this agreement are subject to the federal Pipeline Safety Act (49 USC Chapter 601) and federal pipeline regulations.

CSFM's responsibility for intrastate lines is covered in the Elder California Pipeline Safety Act of 1981 (Chapter 5.5, California Government Code). The agency's responsibilities are twofold:

- ! To enforce federal minimum pipeline safety standards over all regulated interstate hazardous liquid pipelines within California; and
- ! To enforce federal minimum pipeline safety standards as well as the Elder California Pipeline Safety Act of 1981 on regulated hazardous liquid intrastate pipelines.

The California Division of Oil, Gas, and Geothermal Resources (DOGGR) has regulatory authority over all oil, gas, and geothermal exploration and production operations in the State. As a part of this authority, DOGGR has responsibility for regulating flowlines, gathering lines, and other in-field pipelines used to transport crude oil, natural gas, and other fluids. DOGGR's pipeline jurisdiction ends at the administrative boundary of a field, which is usually the point where ownership of oil or gas is transferred to a pipeline company or oil shipper.

As a result, there are crude oil pipelines which are not regulated by any State agency. These pipelines include those which leave DOGGR oil fields and do not meet the pipeline definition of Section 51010.5 of the California Government Code. These pipelines are the subject of this study.



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### 1.2 Relative Safety Perspective

Before we analyze the risks associated with California's hazardous liquid pipelines, it is important to put the relative safety of pipelines versus other modes of transportation into perspective. The United States Department of Transportation, Research and Special Programs Administration's 1995 National Transportation Statistics - Annual Report provides some useful statistics in this regard.

During 1993, there were 43,179 transportation-related fatalities in the United States. This data is presented in Table 1-1 by mode of transportation. It should be noted that of the fourteen 1993 pipeline fatalities all occurred on gas pipelines. There were no fatalities which resulted from incidents on hazardous liquid pipelines.

Table 1-1  
**Fatalities by Mode of Transportation**  
1993 National Transportation Statistics

Mode	Fatalities	% of Total
Pipeline	14	0.03%
Air	782	1.81%
Marine	904	2.09%
Rail	1,349	3.13%
Highway	40,115	92.94%
Total	43,164	

In an attempt to compare the relative safety of each transportation mode, we have estimated the fatality rate per billion ton-miles transported. This was done by first determining the number of 1993 fatalities associated with revenue freight. This was performed for each mode of transportation as follows:

- ! Pipelines - All fatalities were included.
- ! Rail - All fatalities, including those occurring at grade crossings with vehicular traffic were included.



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- ! Marine - Recreational boating fatalities were excluded.
- ! Air - All general aviation, air taxi, and commuter fatalities were excluded. Since the remaining air carrier data does not differentiate between incidents associated with passenger traffic versus those associated with freight, the resulting number of revenue freight fatalities is unrealistically high.
- ! Highway - Only truck fatalities were included. Since truck accidents often result in fatalities to those in automobiles, the resulting *truck only* fatality figure is unrealistically low.

The fatality rate was then determined by dividing the number of fatalities by the number of ton-miles transported. The number of fatalities and resulting fatality rates are presented in Tables 1-2 and 1-3. Despite the inherent data errors, the resulting rates provide a very useful method for determining the relative magnitudes of risk to human life. These results are summarized below, using an arbitrarily assigned risk of 1 for pipelines.

Pipelines	1
Marine	5
Rail	51
Highway	429

In other words, rail transportation results in roughly 51 times more fatalities than pipelines for a given number of ton-miles transported. Order of magnitude comparisons between the other modes could be determined similarly.

A general understanding of these relative risks is essential for those considering regulatory changes which could increase the cost of hazardous liquid pipeline construction, operation, and/or maintenance. Any increases in the shipping costs associated with such changes would likely result in a portion of the throughput being diverted from pipelines to other transportation modes. Since these other modes generally expose the public to a higher risk than pipelines, any such diversion may actually decrease overall transportation safety. For example, if a costly regulation decreased pipeline accidents by say 10%, but diverted some volume to an alternate, less safe mode of transportation, the new result may be a decrease in overall transportation safety.



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There are already signs of this occurring, especially in Southern California. The crude from many of the older production fields which was historically transported by pipeline, has been diverted to truck transportation which has the worst safety record.

Table 1-2  
**Estimated Fatalities Associated with Revenue Freight**  
1993 National Transportation Statistics

Mode	Fatalities	% of Total
Pipeline	14	0.13%
Air	n/a	n/a
Marine	104	0.98%
Rail	1,349	12.77%
Highway	9,097	86.11%
Total	10,564	

Table 1-3  
**Estimated Fatalities Per Billion Ton-Miles Transported**  
1993 National Transportation Statistics

Mode	Fatalities	% of Total
Pipeline	0.02	0.17%
Air	n/a	n/a
Marine	0.11	0.93%
Rail	1.23	10.42%
Highway	10.44	88.47%
Total	11.80	